Claims

[c1] WE CLAIM:

1.An Ethernet industrial control system for transferring a plurality of messages, wherein the messages are tagged with identifiers of varying levels of priority, ranging from a highest priority to a lowest priority, the system comprising:
a serial network bus; and
means for placing the message onto the bus, wherein a message having a higher priority identifier is placed onto the bus before placing a message with a lesser priority identifier onto the serial network bus.

[c2] 2.The system of claim 1, wherein the levels of priority adhere to IEEE802 standards.

[c3] 3.The system of claim 1, wherein the message placing means is a fast communication, reduced UDP-IP stack.

[c4] 4.The system of claim 3, wherein the fast communication, reduced UDP-IP stack is dedicated for time critical flow.

[c5] 5. The system of claim 4, including a plurality of communication stacks, wherein the fast communication, reduced UDP-IP stack operates in parallel with the other communication stacks.

[c6] 6.The system of claim 5, wherein the communication stacks are dedicated to specific classes of messages.

[c7] 7.The system of claim 1, wherein a slave device is communicatively coupled to the bus and a clock synchronization message for the slave device is tagged with the highest priority identifier.

[c8] 8.The system of claim 7, wherein a master device is communicatively coupled to the bus and the master device places the clock synchronization message on the bus.

[c9] 9.The system of claim 4, wherein the fast communication, reduced UDP-IP stack is dedicated to a clock synchronization message class.

[c10] 10.For an Ethernet industrial control system having a master device having master clock, an I/O module having a local device clock and a bus communicatively coupling the master device and the I/O module, wherein messages having varying levels of priority are placed on the bus by the master device, including a clock synchronization message for synchronizing the local device clock with the master clock, a method for quickly synchronizing the local device clock with the master clock, the method comprising:
generating a clock synchronization message, synchronized to the master clock;
tagging the clock synchronization message with a high priority identifier;
tagging other messages with a lesser priority identifier; and
placing the message having the high priority identifier onto the bus before placing the message with the lesser priority identifier onto the bus.

[c11] 11.The method of claim 10, further using a first fast communication, reduced UDP-IP stack to place the message having the high priority identifier onto the bus before placing the message with the lesser priority identifier onto the bus.

[c12] 12.The method of claim 11, further dedicating the first fast communication, reduced UDP-IP stack for time critical flow.

[c13] 13.The method of claim 12, further employing a second fast communication, reduced UDP-IP stack dedicated to I/O scan messages.

[c14] 14.The method of claim 11, further employing a plurality of communication stacks for network message traffic of a plurality of priority levels.

[c15] 15.The method of claim 11, further using a switch to retain network compatibility between tagged and untagged network devices.

[c16] 16.The method of claim 11, further tagging network traffic with an IEEE 802 tag control information field inserted in a network frame header.

[c17] 17. The method of claim 16, further using priority level tags ranging from 7 (highest priority) to 0 (lowest priority).

[c18] 18.The method of claim 15, further adding VLAN information to untagged frames by assigning them a priority of 0 (the lowest priority) and removing

VLAN information to frames addressed to untagged devices.

[c19] 19.The method of claim 11, further using motion controls, drives and robots applications as the I/O modules requiring fast synchronization.

[c20] 20.The method of claim 11, further coexisting applications requiring voice, message, or image transmissions on the same network.

[c21] 21.An Ethernet industrial control system for transferring messages, wherein a message is tagged with identifiers of varying levels of priority, the system comprising:
a master device having means for generating a clock synchronization message;
an I/O module having a slave clock responsive to the clock synchronization message for synchronizing the slave clock with the master clock; and
a bus communicatively coupling the master device and the I/O module, wherein the master device includes means for tagging the clock synchronization message with a high priority identifier, means for tagging other messages with a lesser priority identifier, and means for placing the message having the high priority identifier onto the bus before placing a message with a lesser priority identifier onto the bus.

[c22] 22. The system of claim 21, wherein a fast communication, reduced UDP-IP stack is dedicated for time-critical flow.

[c23] 23.The system of claim 21, wherein there is network compatibility between tagged and untagged network devices.

[c24] 24.The system of claim 21, wherein a tag control information field is inserted into network traffic in a network frame header to indicate traffic priority.

[c25] 25. The system of claim 24, wherein the priority level tags range from 7 (highest priority) to 0 (lowest priority).

[c26] 26.The system of claim 21, wherein a switch adds VLAN information to untagged messages by assigning them a priority of 0 (the lowest priority) and removes VLAN information to messages addressed to untagged devices.

[c27] 27.The system of claim 21, wherein the message transfer has synchronous scheduling of network exchanges and code execution for consistent message on all network devices.

[c28] 28. The system in claim 21, wherein an industrial control system has motion controls, drives and robots applications requiring fast synchronization.

[c29] 29.The system in claim 28, wherein the industrial control system has electrical distribution applications requiring discrimination of events.

[c30] 30.The system in claim 28, wherein the industrial control system transfers message automation applications with Ethernet management issues.